Data on the Arctic Grayling Sport Fishery at Kakisa River, Northwest Territories, 1980

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Canadian Data Report of
Fisheries and Aquatic Sciences 390

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by

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ABSTRACT

DAHLKE, L.W. 1983. Data on the Arctic grayling sport fishery at Kakisa River, Northwest Territories, 1980. Can. Data Rep. Fish. Aquat. Sci. 390: iv + 11 p.

During the spring of 1980 a creel census, biological sampling and tagging study was conducted on the Arctic grayling sport fishery at Kakisa River, Northwest Territories. The 468 anglers interviewed spent 1 275 hours angling with success rates for Arctic grayling of 218 per angler or 1.0 per angler-hour. The total catch was estimated to be 1 297 Arctic grayling with 52% retained, resulting in a harvest of 764 fish (723 kg).

Data on the sport fishery, the biology of the Arctic grayling and tag return information from the Kakisa River for 1980 are presented in tabular form.

Key words: angling; catch composition; catch/effort; exploitation; fishery management; harvest; tagging; Thymallus arcticus (Pallas).

RESUME

DAHLKE, L.W. 1983. Data on the Arctic grayling sport fishery at Kakisa River, Northwest Territories, 1980. Can. Data Rep. Fish. Aquat. Sci. 390: iv + 11 p.

Au printemps 1980, on a effectué le recensement des prises, l'échantillonnage biologique et l'étude des étiquettes des ombres arctiques pêchés à la ligne (pêche sportive) de la Kakisa rivière; dans les Territoires du Nord-Ouest. Les 468 pêcheurs sportifs interviewés ont passé 1 275 heures à pêcher à la ligne pour attraper 218 ombres, ou un poisson par heure par pêcheur. Environ 52% des quelque 1 297 ombres pêchés ont été relâchés, ce qui donne une prise totale de 764 poissons (723 kg).

Les résultats du recensement et de l'échantillonnage biologique effectués en 1980 à l'égard des ombres arctiques, Thymallus arcticus (Pallas), de la Kakisa rivière, ainsi que les données provenant des retours d'étiquettes, sont présentés sous forme de tableaux.

Mots-clés: pêche à la ligne; composition de la prise; prises/effort; exploitation; gestion des pêches; prise; étiquetage; Thymallus arcticus.

INTRODUCTION

The Kakisa River has been used as a recreational fishing area by the residents of Hay River and Pine Point as well as northern Alberta (Moshenko and Low 1983). The river has a high aesthetic value as well as being one of the first rivers in the area to be open to angling in the spring. One of the most important sport fish species in the Kakisa River is Arctic grayling, Thymallus arcticus (Pallas). Catch and possession limits for Arctic grayling in the portion of the upper Mackenzie River between 116° and 118° west longitude including the Kakisa River were reduced from 10 and 10 to 5 and 10 with a minimum size limit of 356 mm (14 in) in 1974 after a study by Falk and Gillman (1974). In 1979, the catch and possession limits for grayling were further reduced to 3 and 5 with a minimum size limit of 356 mm after a second study by Falk and Gillman (1980).

In the spring of 1980, a creel census, biological sampling and tagging study was conducted on the Kakisa River (Fig. 1). This was part of an ongoing monitoring program of the Arctic grayling sport fishery which was initiated in 1971. Previous studies conducted on the Kakisa River grayling have been reported by Falk and Dahlke (1975), Falk et al. (1980), and Moshenko and Low (1983).

This report presents the results of the 1980 study in tabluar form.

MATERIALS AND METHODS

CREEL CENSUS

A creel census and biological sampling program was conducted on the Kakisa River during the period 25 April to 11 May, 1980. Creel census techniques were adapted from Falk et al. (1973, 1974) and Moshenko and Gillman (1978). The major angling and camping areas are shown in Fig. 2. Anglers were interviewed at the camp grounds by the bridge, the old road fiord and Lady Evelyn Falls as they left the river, or at the end of the day if they intended to stay the night. Each person was asked their place of residence, the number of fish caught, kept, and released by species, and the time spent angling to the nearest quarter-hour. When people could not be interviewed they were included in the records as missed interviews.

Species caught at Kakisa River were identified according to Scott and Crossman (1973) as: Arctic grayling, Thymallus arcticus (Pallas); northern pike, Esox lucius Linnaeus; yellow walleye, Stizostedion vitreum (Mitchill); longnose sucker, Catostomas catostomas (Forster); round whitefish, Prosopium cylindraceum (Pallas); and lake whitefish, Coregonus clupeaformis (Mitchill).

A subsample of 200 Arctic grayling from the anglers' creel was sampled for fork length (±1 mm), round weight (±50g), sex and maturity. As well, scales were taken from the left side above the lateral line, posterior to the leading edge of the dorsal fin and stored dry in scale envelopes for later age determination. In the lab scales were placed between two glass slides and the annuli counted on the image produced by an Eberbach microprojector (60x). The number of completed annuli was taken to be the age.

Maturity was determined by examining the gonads and coded according to the stages described in Appendix 1.

TAGGING

As part of the 1980 study, a portion of the Arctic grayling population from the Kakisa River were tagged. Grayling, angled by project personnel downstream of the bridge (Fig. 2), were tagged using numbered Floy tags and released. Prior to release, grayling were measured for fork length (±1 mm) and scales taken for age determination. A reward was offered for the return of the tag and related information.

DATA ANALYSIS

All biological data were analyzed using the IBM 370/168 computer based at the University of Manitoba. The Statistical Analysis System (1979) was used to generate length, weight and age tables and perform basic calculations. A Hewlett-Packard programmable calculator (Model 9810-A) was used to perform some analyses.

Total annual mortality rates were calculated using the methods outlined by Robson and Chapman (1961). Weight-length relationships were determined using the following equation:

$$\text{Log}_{10} W = a + b\ (\text{Log}_{10} L)$$

where: W = weight in grams
a = Y-intercept
b = slope of the regression line, and
L = fork length in millimetres

The standard deviation of the coefficient b (S_b) was also calculated.

Relative condition factors (K) were determined using the formula:

$$K = \frac{W \times 10^5}{L^3}$$

ACKNOWLEDGMENTS

The author would like to thank all the anglers for their cooperation during the 1980 creel census. A special thanks to the Hay River Fisheries and Oceans staff who helped with the census and the tagging programs. C.J. Read determined the scale ages. Figures were prepared by the Graphics Services, Freshwater Institute. R.W. Moshenko and M. Roberge reviewed the manuscript.

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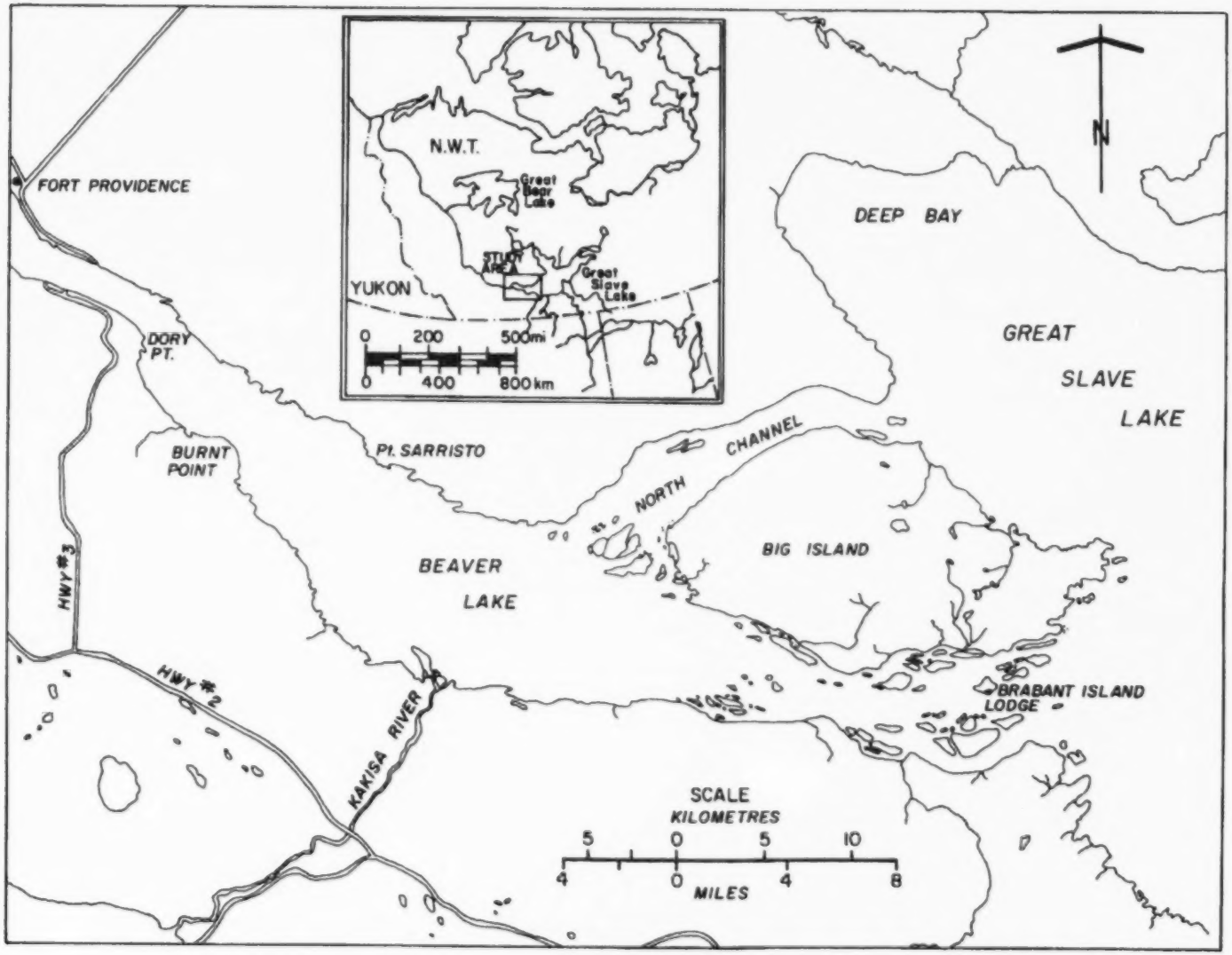


Fig. 1. Map of the upper Mackenzie River showing the location of the Kakisa River.

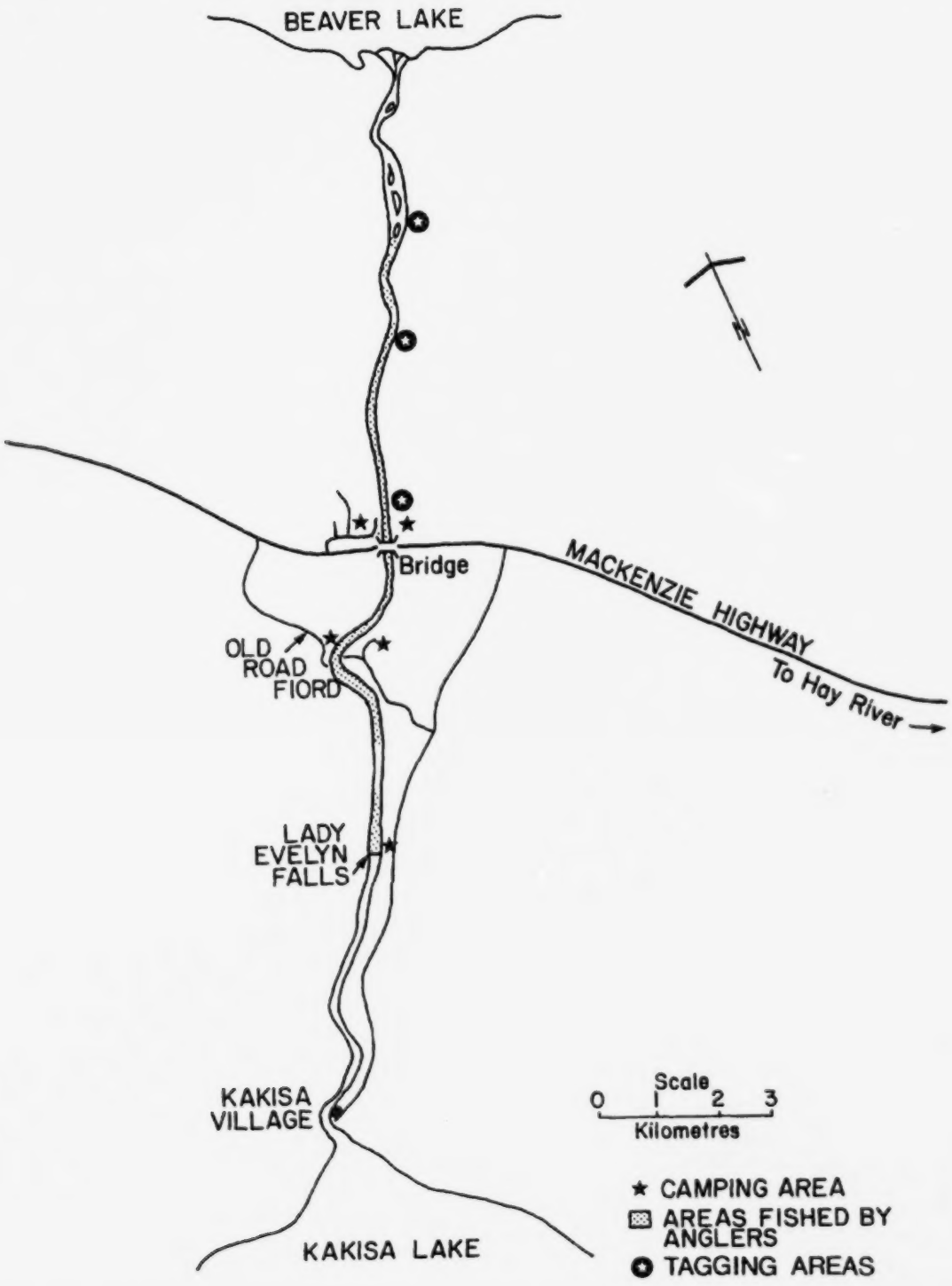


Fig. 2. Map of the Kakisa River showing the angling and tagging locations, 1980.

Table 1. Information on the creel census and fishing periods on the Kakisa River, 1980.

Fishing Season				Creel Census Period				Angler-Interviews	
From	To	Days	Percent Fished	From	To	Days	Percent Censused	Conducted	Possible
25 April	11 May	17	100	25 April	11 May	17	100	468	482

Table 2. Information on the catch, effort and catch per unit of effort for Arctic grayling during the creel census period from the Kakisa River, 1980.

No. Anglers	No. Caught	No. Released	No. Retained	Percent Retained	Hours Fished	Hours Fished per Angler	No. Caught		No. Retained
							per Angler-Day	per Angler-Hr.	per Angler-Day
468	1297	621	679	52	1275.5	2.7	2.8	1.0	1.5

Table 3. Information on the total catch and harvest of Arctic grayling from the Kakisa River, 1980.

o. ught	No. Released	No. Retained	Release Mortality	Total Harvest	Harvest per angler
36	636	700	64	764	1.59

Table 4. Creel census summary from the Kakisa River, 1980.

Date (D/M)	No. Anglers Interviewed Successful	Unsuccessful	Percent Successful	A. Grayling C[a]	R[b]	K[c]	N. Pike C	R	K	Walleye C	R	K	L. Sucker C	R	K	L. Whitefish C	R	K	Hours Fished	No. Caught per Angler	per Angler-Hr.
25/4	2	0	100.0	6	0	6	-	-	-	-	-	-	-	-	-	-	-	-	4.0	3.0	1.5
26/4	15	3	83.3	43	14	29	-	-	-	1	0	1	-	-	-	2	0	2	60.0	2.6	0.8
27/4	22	22	50.0	39	1	38	-	-	-	-	-	-	-	-	-	1	1	0	145.0	0.9	0.3
28/4	0	4	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?	0.0	-
29/4	2	2	50.0	7	1	6	-	-	-	-	-	-	-	-	-	-	-	-	6.0	1.8	1.2
30/4	3	0	100.0	14	8	6	2	0	2	-	-	-	1	1	0	-	-	-	6.0	5.7	2.8
1/5	7	4	63.6	10	1	9	1	1	0	-	-	-	-	-	-	-	-	-	10.0	1.0	1.1
2/5	22	2	91.7	94	46	48	7	4	3	-	-	-	1	1	0	6	1	5	45.0	4.5	2.4
3/5	105	34	75.5	502	263	239	30	16	14	-	-	-	33	27	6	1	0	1	397.0	4.1	1.4
4/5	59	17	77.6	241	116	125	25	8	17	2	2	0	6	6	0	3	0	3	238.0	4.2	1.2
5/5	13	2	86.7	69	40	20	3	2	1	-	-	-	1	1	0	-	-	-	5.0	4.9	14.4
6/5	5	0	100.0	26	7	19	3	2	1	-	-	-	5	5	0	-	-	-	9.0	7.0	3.9
7/5	3	0	100.0	74	70	4	-	-	-	-	-	-	-	-	-	-	-	-	15.0	22.7	4.9
8/5	4	0	100.0	4	0	4	4	0	4	-	-	-	11	11	0	1	1	0	20.0	5.0	1.0
9/5	12	0	100.0	48	23	25	13	12	1	-	-	-	45	45	0	5	5	0	36.5	9.3	3.0
10/5	52	17	75.4	102	29	73	17	6	11	6	0	6	28	26	2	9	8	1	182.5	2.3	0.9
11/5	28	7	80.0	18	2	16	4	1	3	-	-	-	10	7	3	3	2	1	75.0	1.0	0.5
Total	354	114	75.6	1297	621	679	111	54	57	9	2	7	141	130	11	31	18	13	1275.5	-	-
Mean	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.4	1.3

	A. Grayling	N. Pike	Walleye	L. Sucker	L. Whitefish
Percent Retained	52.4	51.4	77.8	7.8	41.9
No. Caught per Angler-Hr.	1.02	0.09	0.01	0.11	0.02
No. Caught per Angler	2.77	0.24	0.02	0.3	0.07

[a] Number caught
[b] Number released
[c] Number retained

Table 5. Summary of information on the origin of anglers and hours fished as determined during the creel census period on the Kakisa River, 1980.

Origin	Anglers Interviewed		Hours fished	
	No.	%	No.	%
Northwest Territories	285	60.9	706.0	55.4
Alberta	178	38.0	562.0	44.1
Saskatchewan	1	0.2	2.0	0.2
U.S.A.	4	0.9	5.5	0.4
Total	468		1275.5	

Table 8. Summary of the 1980 recapture information for Arctic grayling tagged in Kakisa River.

Tagging Information		Recapture Information			
Date (D/M/Y)	Fork Length (mm)	Location	Date (D/M/Y)	Forklength (mm)	Elapsed Time (Days)
7/5/77	390	Kakisa R.	3/5/80	458	1091
11/5/78	453	Kakisa R.	3/5/80	476	722
12/5/79	345	Kakisa R.	4/5/80	414	357
13/5/79	460	Kakisa R.	3/5/80	460	355
13/5/79	400	Kakisa R.	3/5/80	412	355
15/5/79	420	Kakisa R.	2/5/80	429	352
15/5/79	470	Kakisa R.	2/5/80	466	352
16/5/79	403	Kakisa R.	6/5/80	426	355
26/4/80	467	Kakisa R.	-/5/80	-	-
29/4/80	-	Kakisa R.	16/5/80	-	17
2/5/80	445	Kakisa R.	3/5/80	449	1

Table 6. Summary of weight-length relationship statistics for angled Arctic grayling from the Kakisa River, 1980.

Sex	N	Y-intercept (a)	Slope (b)	Standard Deviation of b (S_b)	95% Confidence Interval of b
Male	100	-4.4587	2.830	0.119	2.592 - 3.068
Female	97	-4.2992	2.771	0.140	2.491 - 3.050
Combined	200	-4.2435	2.749	0.086	2.577 - 2.921

Table 7. Annual survival and mortality rates for angled and tagged Arctic grayling from the Kakisa River, 1980.

Sample	Sex	N	Age Classes Used	Survival (S)	SE of S	Var of S	95% C.I. of S	Annual Mortality Rate
Creel Census	Male	99	8-10	0.2778	0.1017	0.0103	0.0743-0.4812	0.7222
	Female	93	7-10	0.3582	0.0579	0.0034	0.2424-0.4740	0.6418
	Total	195	7-10	0.5696	0.0549	0.0030	0.4598-0.6794	0.4304
Tagged	Total	148	7-10	0.4500	0.0418	0.0017	0.3664-0.5336	0.5500
Combined	Total	343	7-10	0.4015	0.0298	0.0009	0.3419-0.4611	0.5985

Table 9. Biological data by length interval for Arctic grayling caught by angling from the Kakisa River, 1980.

LENGTH INTERVAL (MM)	MALES						FEMALES						COMBINED					
		LENGTH(MM)	WEIGHT(G)			%		LENGTH(MM)	WEIGHT(G)			%		LENGTH(MM)	WEIGHT(G)			%
	N	MEAN	MEAN	SD	K	MAT	N	MEAN	MEAN	SD	K	MAT	N	MEAN	MEAN	SD	K	MAT
310	-	-	-	-	-	-	-	-	-	-	-	-	1	313	500	-	1.63	0
320	1	328	450	-	1.28	0	-	-	-	-	-	-	1	328	450	-	1.28	0
360	2	363	600	71	1.25	50	2	364	575	35	1.19	100	4	364	588	48	1.22	75
370	6	374	667	41	1.28	100	5	376	650	35	1.23	60	11	375	659	38	1.25	82
380	5	384	700	71	1.24	100	4	386	738	25	1.29	100	9	385	717	56	1.26	100
390	9	394	783	66	1.28	100	10	395	785	53	1.27	100	19	395	784	58	1.27	100
400	9	405	833	71	1.25	100	10	406	895	86	1.34	100	19	406	866	83	1.30	100
410	10	414	920	123	1.29	100	24	414	910	61	1.28	100	34	414	913	82	1.29	100
420	19	424	934	80	1.23	100	11	424	964	74	1.27	100	30	424	945	78	1.24	100
430	12	435	1046	94	1.27	100	9	433	1056	95	1.30	100	21	434	1050	92	1.29	100
440	9	444	1061	102	1.21	100	13	444	1088	62	1.24	100	23	444	1083	86	1.24	96
450	6	456	1158	58	1.23	100	6	453	1067	82	1.15	100	13	455	1123	88	1.20	92
460	7	462	1243	89	1.26	100	2	465	1275	106	1.27	100	9	462	1250	87	1.27	100
470	4	473	1250	82	1.18	100	1	470	1100	-	1.06	100	5	473	1220	97	1.15	100
480	1	488	1350	-	1.16	100	-	-	-	-	-	-	1	488	1350	-	1.16	100
TOTAL	100						97						200					
MEAN		422	948	199	1.25			418	931	154	1.27			420	940	182	1.26	

Table 10. Biological data by age group for Arctic grayling caught by angling from the Kakisa River, 1980.

AGE (YR)	MALES							FEMALES							COMBINED					
		LENGTH(MM)		WEIGHT(G)			%		LENGTH(MM)		WEIGHT(G)			%		LENGTH(MM)		WEIGHT(G)			%
	N	MEAN	SD	MEAN	SD	K	MAT	N	MEAN	SD	MEAN	SD	K	MAT	N	MEAN	SD	MEAN	SD	K	MAT
3	2	355	38.2	550	141	1.22	50	-	-	-	-	-	-	-	3	341	36.3	533	104	1.36	33
4	11	389	23.8	727	151	1.22	91	6	395	14.2	775	69	1.26	83	17	391	20.6	744	127	1.23	88
5	26	406	21.0	852	133	1.27	100	13	392	18.8	773	151	1.27	92	39	401	21.2	826	142	1.27	97
6	22	423	20.2	970	172	1.27	100	30	412	14.6	907	120	1.29	100	52	417	17.8	934	146	1.28	100
7	24	434	13.9	1006	110	1.23	100	25	419	16.8	944	116	1.28	100	49	427	17.0	974	116	1.25	100
8	10	461	14.6	1205	98	1.23	100	15	441	14.8	1067	101	1.24	100	27	449	17.0	1131	120	1.25	93
9	3	466	7.9	1250	100	1.24	100	3	454	14.2	1083	29	1.16	100	6	460	12.2	1167	113	1.20	100
10	1	462	-	1250	-	1.27	100	1	467	-	1350	-	1.33	100	2	465	3.5	1300	71	1.30	100
TOTAL	99							93							195						
MEAN		422	30	947	200	1.25			417	23.0	926	154	1.27			419	27.9	938	183	1.26	
MEAN AGE	6.2																				

Table 11. Biological data by length interval for tagged Arctic grayling from the Kakisa River, 1980.

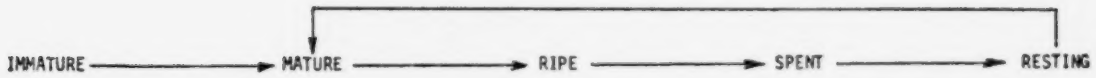
LENGTH INTERVAL (MM)	NO.	PERCENT	MEAN FORK LENGTH(MM)	DRESSED WEIGHT(G) MEAN	SD
310	2	1	316	-	-
340	3	2	346	-	-
360	6	4	365	-	-
370	7	4	376	-	-
380	11	7	384	-	-
390	10	6	395	-	-
400	17	10	405	-	-
410	32	20	414	-	-
420	29	18	424	-	-
430	15	9	435	-	-
440	13	8	445	-	-
450	11	7	452	-	-
460	5	3	463	-	-
470	1	1	473	-	-
TOTAL	162				
MEAN			415	-	-

Table 12. Biological data by age group for tagged Arctic grayling from the Kakisa River, 1980.

AGE (YR)	NO.	PERCENT	FORK LENGTH(MM) MEAN	SD	DRESSED WEIGHT(G) MEAN	SD
3	4	3	335	24.0	-	-
4	8	5	376	17.0	-	-
5	14	9	394	21.2	-	-
6	44	30	413	17.3	-	-
7	39	26	422	16.9	-	-
8	22	15	430	24.1	-	-
9	12	8	443	16.5	-	-
10	6	4	443	19.4	-	-
TOTAL	149					
MEAN			415	27.9	-	-
MEAN AGE	6.7					

Appendix 1. A description of the relative stages of maturity used for northern fish.

MATURITY FLOW CHART



FISH MATURITY CODE

Maturity Stage		Female		Male
Immature (virgin)	1	-Ovaries granular in texture -hard and triangular in shape -up to full length of body cavity -membrane firm -eggs distinguishable	6	-Testes long and thin -tubular and scalloped shape -up to full body length -putty like firmness
Mature	2	-Current year spawner -ovary fills body cavity -eggs near full size but not loose -not expelled by pressure	7	-Current year spawner -testes large and lobate -white to purplish color -centers may be fluid -milt not expelled by pressure
Ripe	3	-Ovaries greatly extended & fill body cavity -eggs full size and transparent -expelled by slight pressure	8	-Testes full size -white and lobate -milt expelled by slight pressure
Spent	4	-Spawning complete -ovaries ruptured and flaccid -seed eggs visible -some retained eggs in body cavity	9	-Spawning complete -testes flaccid with some milt -blood vessels obvious -testes violet-pink in color
Resting	5	-Ovary 40-50% of body cavity -membrane thin, loose, & semi-transparent -healed from spawning -seed eggs apparent with few atretic eggs -some eggs may be retained in body cavity	10	-Testes tubular, less lobate -healed from spawning -no fluid in center -usually full length -mottled and purplish in color
Unknown (Virgin)	0	-cannot be sexed -gonads long or short & thin -transparent or translucent		
Unknown (non-virgin)	11	-resting fish -has spawned but gonads regenerated -sexing not possible		